Intelligent Transportation System and Grid Technology

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Agenda

1. Fundamentals of Research Work
2. Current ITS Projects and Practice
3. Proposed Research and Corporation Areas

Information becomes Lifelines

Intelligent Transportation System

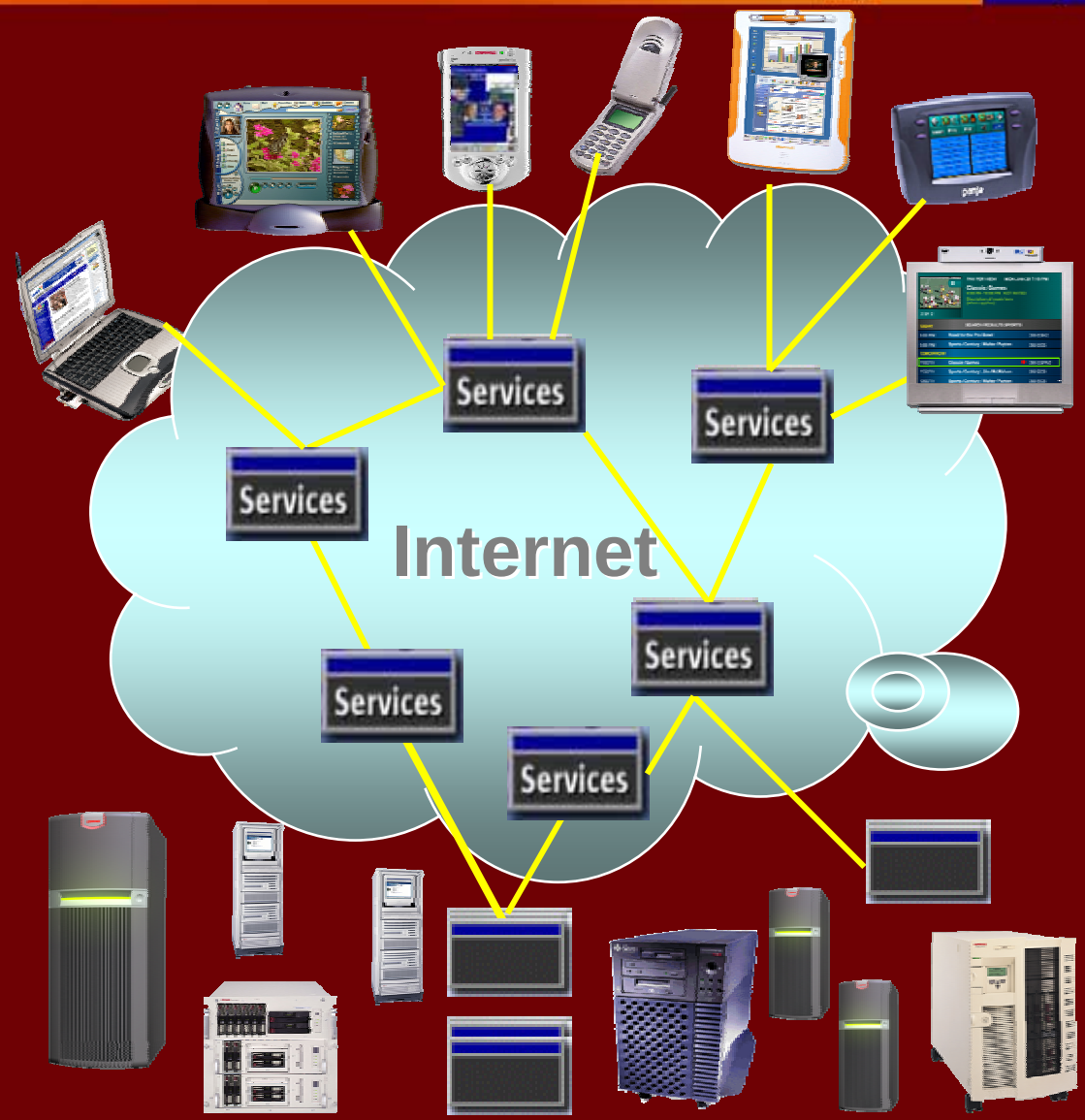
City

Various lifelines are supported by Web & Grid Services Technology

Water

Electric Power

Gas & Oil



Web & Grid Services

Data and functions are shared in the Internet environment through Web Services；achieve distributed registration, deploy and management； various applications exhibited in unified manner; provide integration and avoid application isolation.

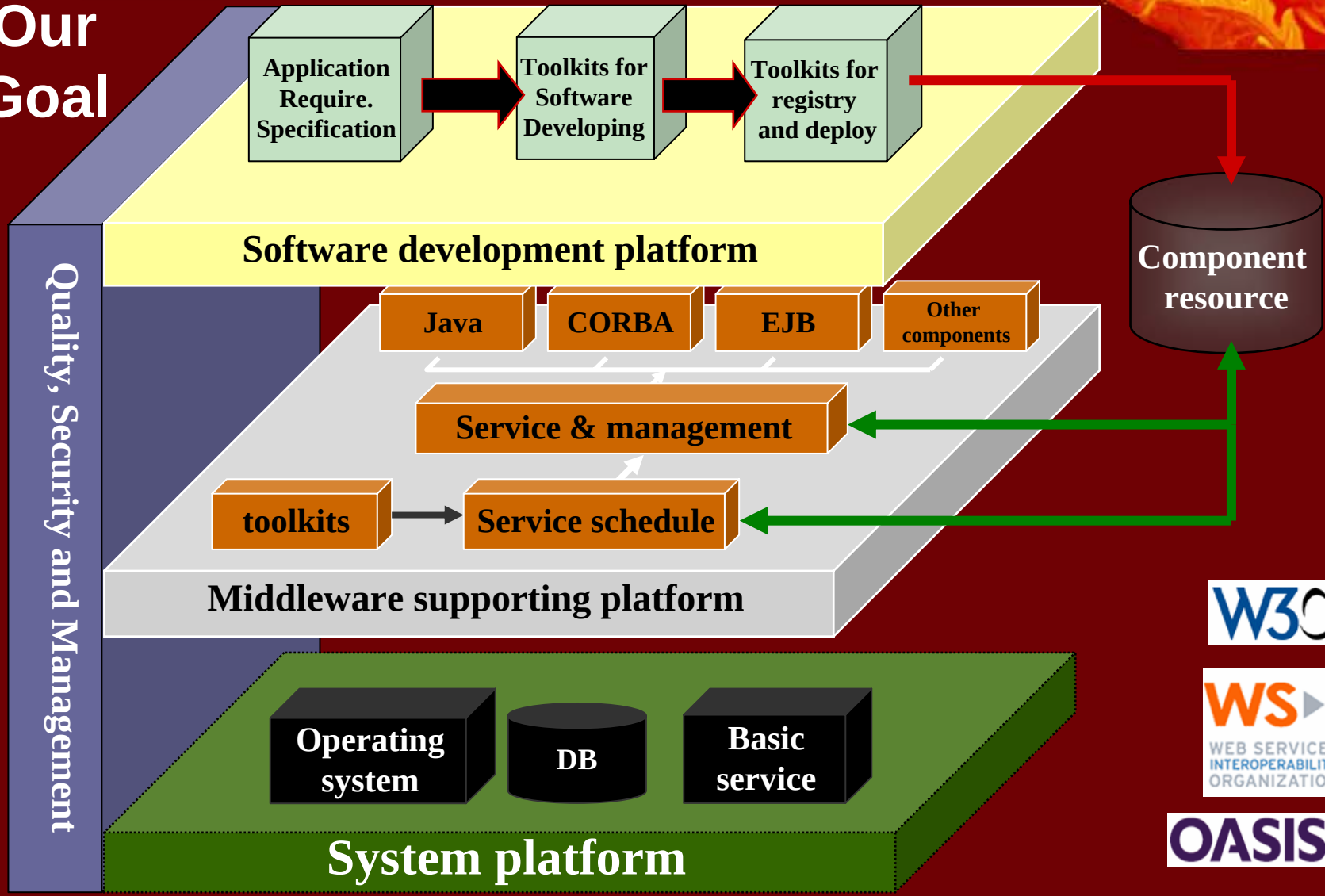
Web Applications

Applications run on the Internet; clients access through browser; data can be shared；but Apps are relatively independent.

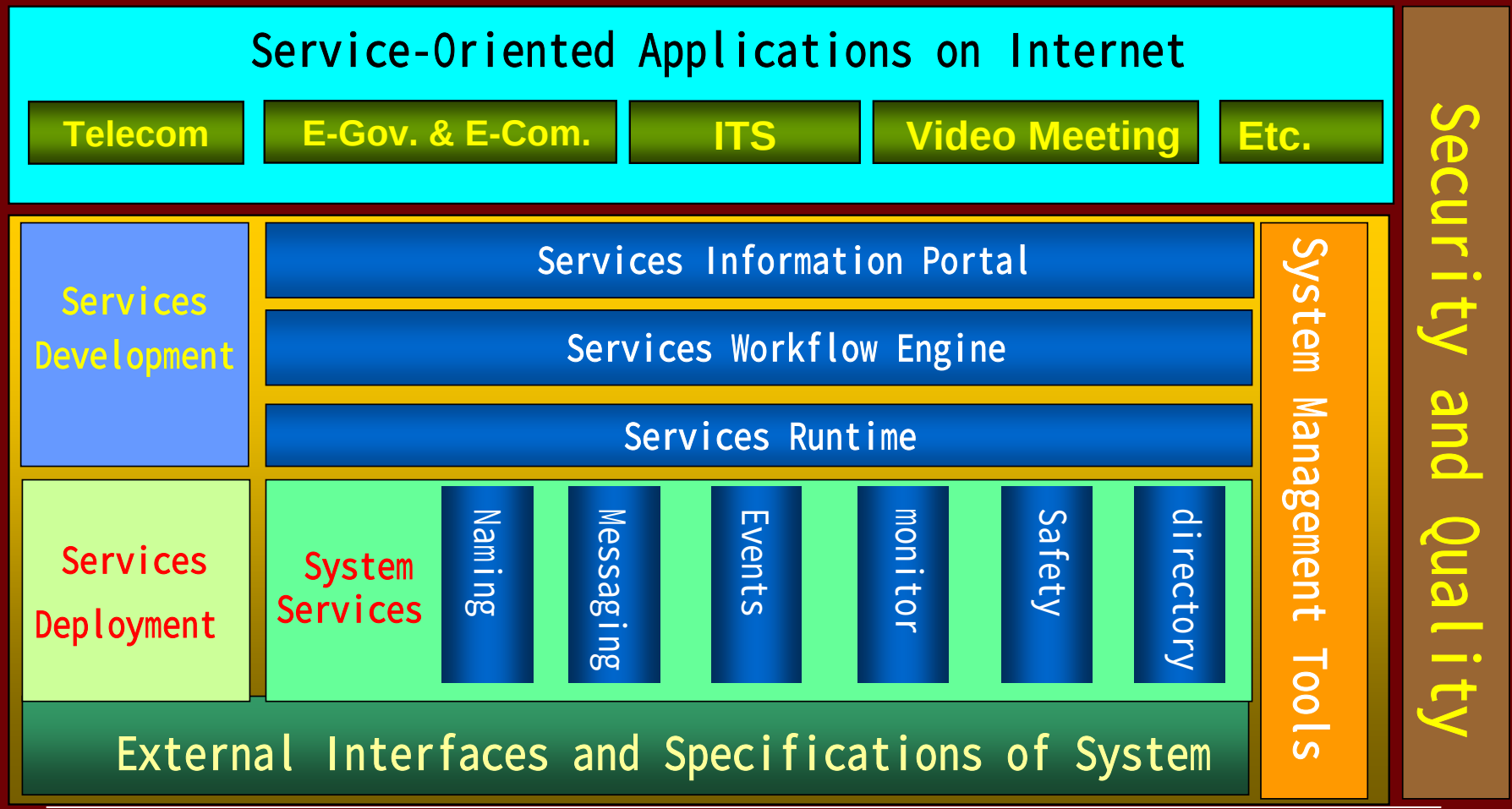
Local Applications

Applications are run, managed and maintained locally；a relatively closed environment; data stored locally

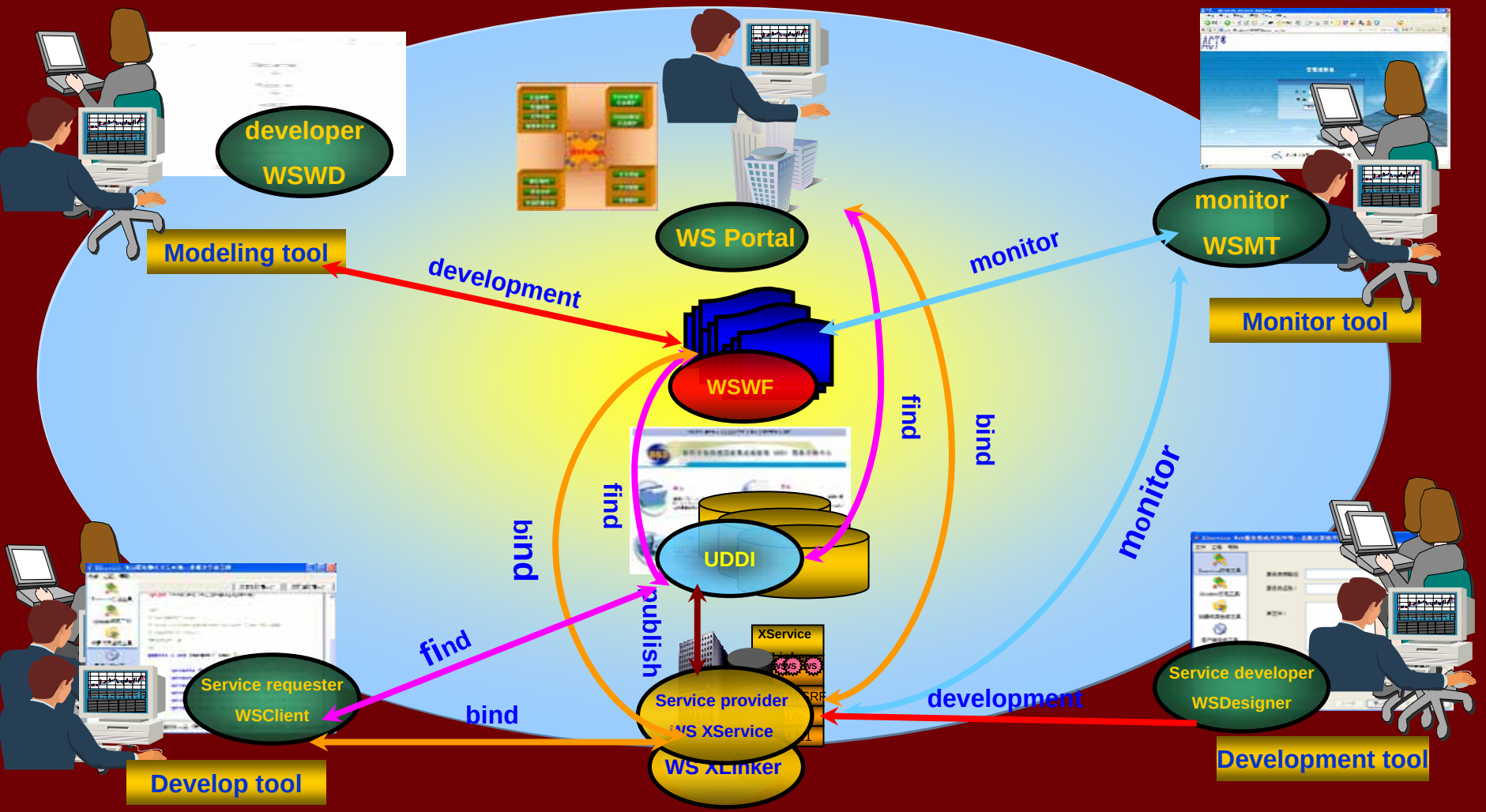
Our Goal


Application Require. Specification
Toolkits for Software Developing
Toolkits for registry and deploy
Software development platform
Component resource
Java
CORBA
EJB
Other components
Service & management
toolkits
Service schedule
Middleware supporting platform
Quality, Security and Management
Operating system
DB
Basic service
System platform

Our Service Environment —— WebSASE's Architecture

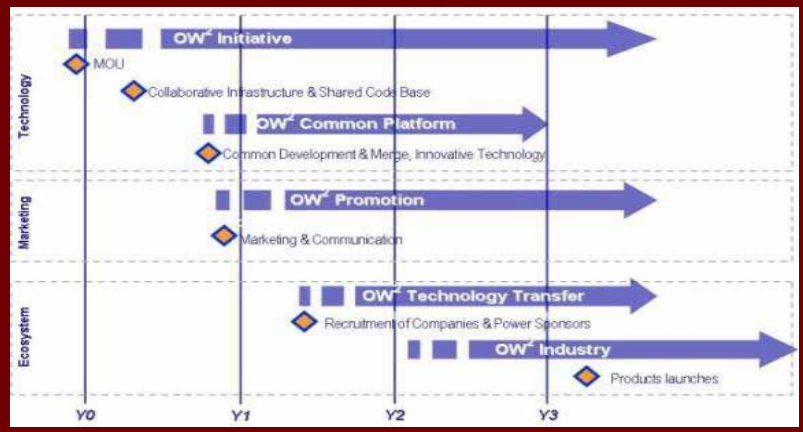


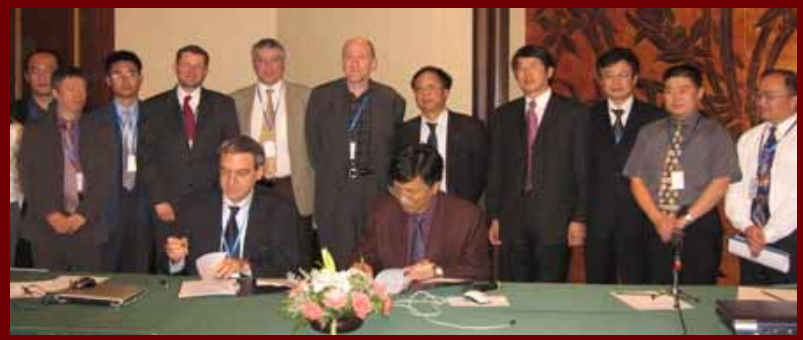
WebSASE: SOA Architecture Implementation



International Cooperation —— ObjectWeb and Orientware

- **Goal of the cooperation**：Develop a common open source platform for next generation middleware focusing on the development and enhancement of a comprehensive set of open source adaptable middleware components.
- **Roadmap**：The set up of joint projects on topics of common interest such as component-based architecture, web services, workflow, transactions, J2EE, autonomous management, CCM and Grid computing.





ObjectWeb Open Source Middleware

四方图件 ORIENTWARE

中国科学院软件研究所

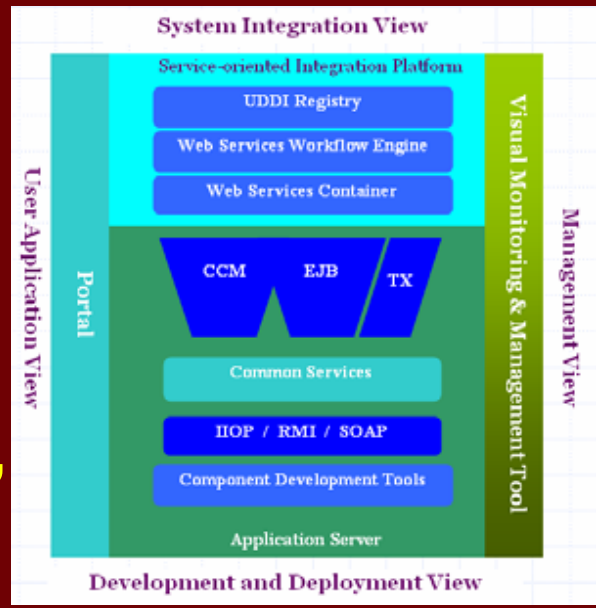
國防科学技術大学

北京航空航天大學 BEIHANG UNIVERSITY

北京大學

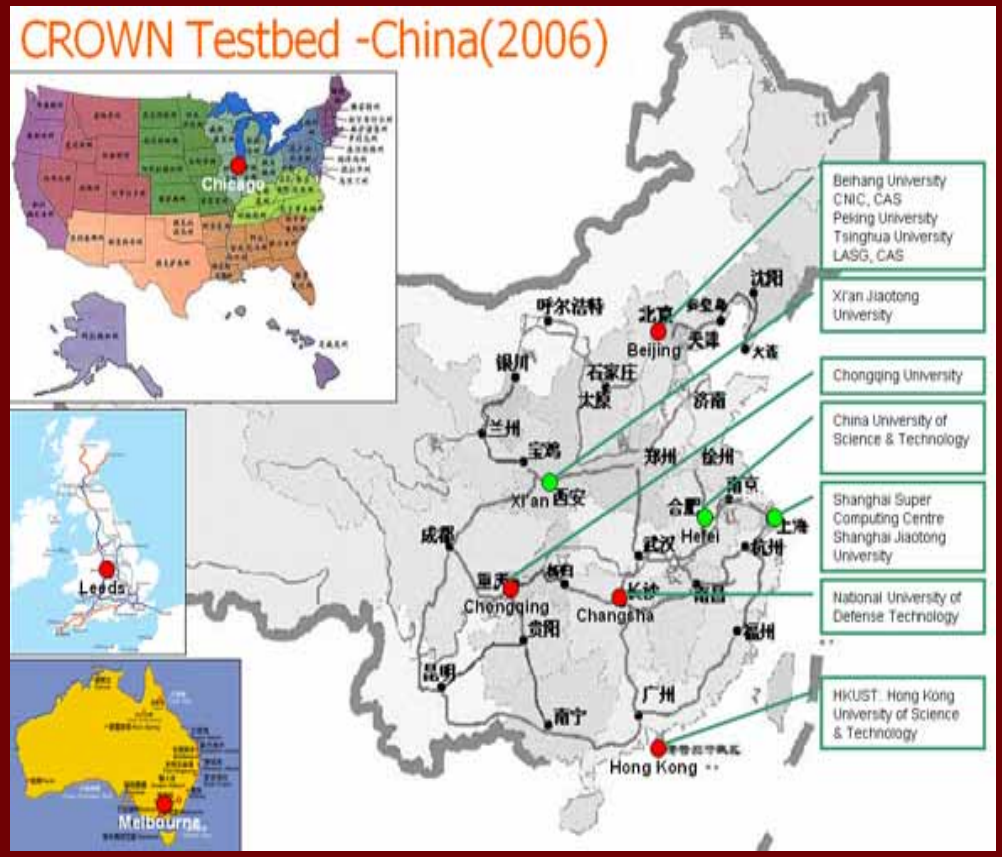
International Cooperation —— ObjectWeb and Orientware

- **The Orientware is a middleware platform that supports development of component and application integration:**
  - interoperation of applying system on Internet and language-neutron
  - general basic services, such as fault-tolerant, real-time, security, transaction
  - approach and tools for developing and deploying component
  - integration of various application system, including multiple protocols, multiple technical platforms, and multiple programming languages
  - united management view, to realize the efficient management of middleware platform and application systems
- **Orientware is based on Web Service, and integrates many mature middleware platforms, such as CORBA, J2EE, TP-Monitor, Portal and Workflow.**



The *CROWN* Program by NSFC

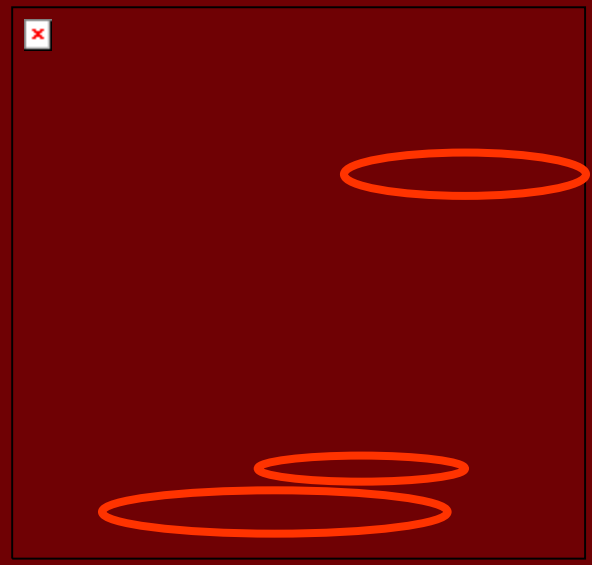
- **China Research and Development Environment Over Wide-area Network, focus on ServiceGrid R&D, testbed and its applications**
- **Key Points**
  - **Duration 2003-2006, Total Funding ￥16 mill**
  - ***Group Members*(Stage 1): 7 Universities and 5 Institutes, such as Beihang U., Peking U., Tsinghua U., NIC/ CAS, discipline partners etc.**



International Cooperation —— e-Science & OMII

UK e-Science Engineering Task Force (ETF)

- CROWN System Evaluation
  - First China Grid Middleware to be Evaluated
  - GT4 evaluated by ETF in June 2005
- Begin in May 2005
- 3 UK Universities participated
  - *University of Southampton (SeSC)*
  - *Imperial College (LeSC)*
  - *University of Newcastle (NEReSC)*

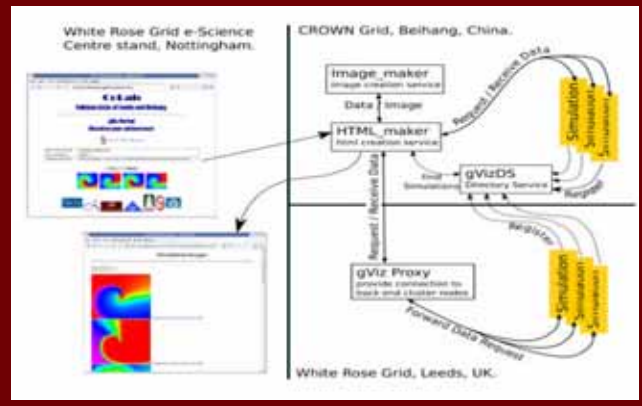


OMII-China：Beihang，Coordinator

- OMII-Europe：Beihang，one of 5 Chinese collaborator
- HEAVEN：Beihang: The only Chinese collaborator
  - **H**osting of **E**mulated **A**pplications in a **V**irtual **EN**vironment
  - 16 participant organizations (from more than 10 counties)

International Cooperation —— Leeds

- **University of Leeds**
  - Setting up CoLaB
    - Cooperation of Leeds University and Beihang University
  - AHM 2005
    - gViz Application
  - Research
    - Fault Tolerance and Security
    - Fault Injection and System Evaluation
  - CoLaB Workshop
    - UK e-Science Programme Proposal – Submitted
    - 7 Workshop (4 in UK, 3 in China), Total Funding: £47.5K



Already launched - ITS

1. **China & Japan co-operate: IPv6 project**
2. **CNGI（China Next Generation Internet）demonstration —— ITS demonstration**
3. **Beijing Olympic Games Communications and Navigation Information Service System**

北京市交通信息中心 BMCC WWW.BJJTW.GOV.CN

北京航空航天大學 BEIHANG UNIVERSITY

中国联通 CHINA UNICOM

Target of Beijing ITS

1. **Build** high efficient platform of communications information, raise level of management of Beijing communications, increase operation efficiency of transportation system

2. **Build** an international advanced and domestic first-class management system of communications, provide a transportation network with fluency, high efficiency, security, convenience and modernization for Beijing citizens and Olympic Games 2008, promote image of Beijing as international metropolis

Present Beijing ITS

E-Government system

Transport dispatch center

Transport command center

Subway dispatch center

Transport information system characters NOW:

- Insufficient consideration of connection with other system when built
- Difficulty of exchange data between systems
- Unable to bring out whole effect

Problems：

- Lack of mechanism and method of information share
- Disunity of standard and specification of data
- Diversity of communication mode
- Inconsistence of statistical result
- Complexity of data fusion technique

Result in：

Request（from management and services aspects）：

- Need to acquire data from other systems urgently
- Weak ability of handling emergent affair

Transport emergency command center

Expressway monitor center

Taxi dispatch center

Passenger transportation network center

Traffic policy info
Traffic strategy and plan info
Traffic development info
Traffic investment info
……

E-Government system

Data exchange

Data share

Data fusion

Data analysis

Data mining

Data process

Data dispose

Integrated transport information platform

Transport emergency command center

Video and image data
Fatal traffic affair report
Emergent time management fore-notice
Urgent rescue resource info
……

Bus route info
Bus running number info
Related route passenger volume info
Related line bus discharge data
……

Transport dispatch center

Expressway monitor center

Freeway basic facilities info
Freeway monitor info
Freeway network info
Freeway traffic volume info
……

Dynamic traffic info
Traffic illegal info
Traffic accident info
Traffic control adjust info
……

Transport command center

Taxi dispatch center

Taxi running vehicle info
Taxi passenger volume info
Taxi driver info
Taxi enterprise info
……

Rail traffic running info
Train arrival and departure info
Rail traffic network info
Running monitor info
……

Subway dispatch center

Passenger transportat

Long-distance transportation station info
Long-distance route info
Long-distance passenger volume info
Long-distance ticket price info
……

policy-making organ.

Government management dept.

Transport enterprise

Social scientific research institute

public

Real-time road query
Vehicle location
Real-time video monitor
History video monitor

GPS

Notebook

Other service

Real-time video monitor service

Vehicle location service

History video monitor service

Real-time road query

Road info database

XService

Internet

Mobile phone

GIS process platform
MapXtreme

PDA

Camera

Current ITS Projects and Practice

- **To improve traffic situation, raise level of traffic management and public information services, integrate resources, focus on emphasis, and serve in world ITS conference 2007 and Olympic Games 2008, we launch works：**
  1. **Olympic Games traffic command center**
  2. **Taxi dispatch and floating vehicle information collection system**
  3. **Beijing integrated information platform of communications and public information service system**

By location info of ejected directly from 122 systems

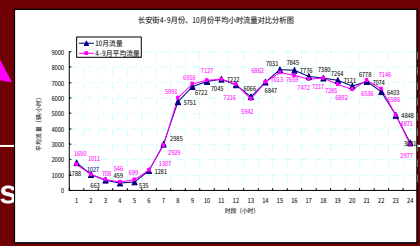
By events location of police marking

Activate peripheral monitor video of event

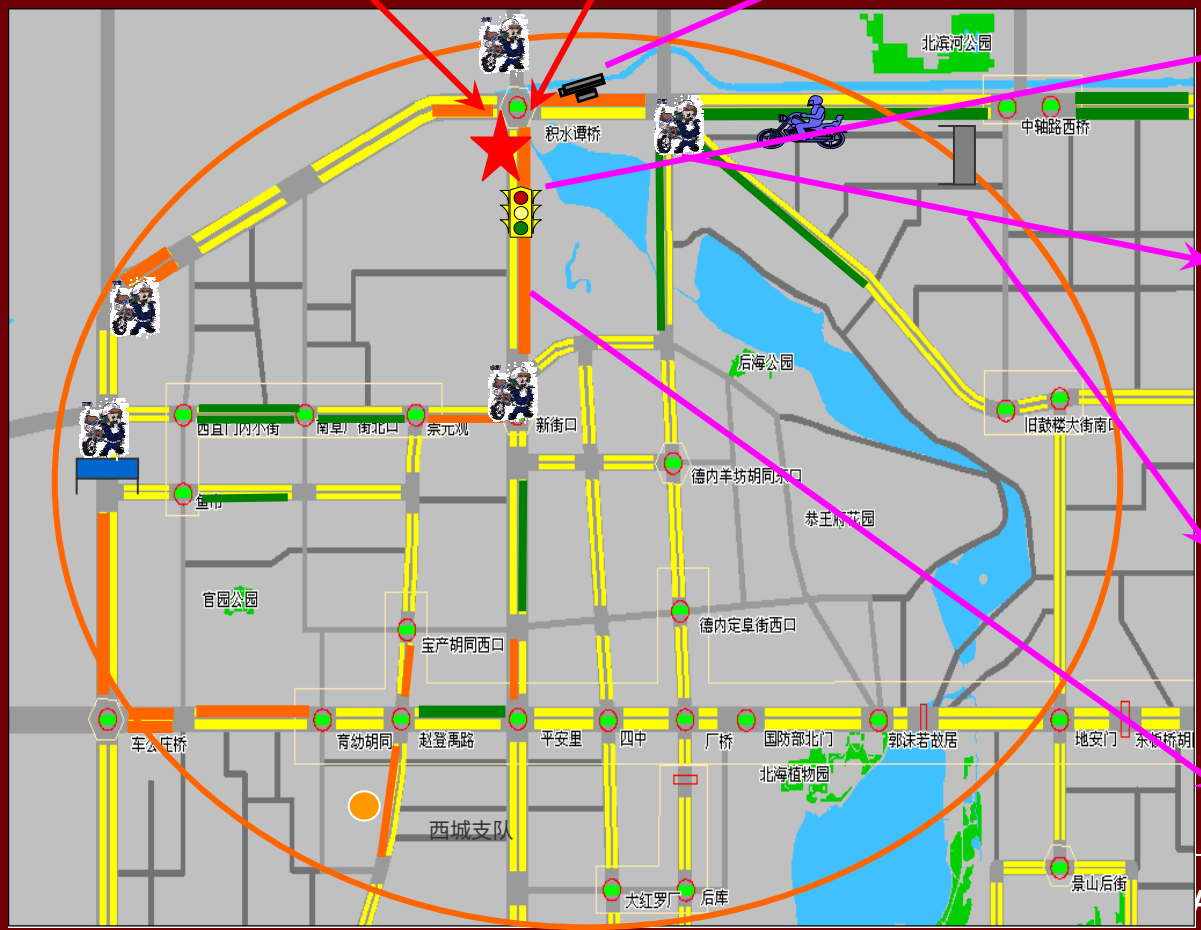
Monitor peripheral crossing signal of event

Display peripheral post info of event

Monitor outdoor screen of peripheral road



Display flow info of peripheral road



Commanding system architecture

three level network: Bureau, sub-division, on-duty team and field commanding in Olympic Games building

Olympic traffic commanding and dispatch center

Sub-center of sub-division

Commanding center of on-duty team

Field command center in Olympic building

Develop dispatch center

Permit running ,
limited competition

Profession management

Adequate protection

Difference and connection between dispatch and safe guard

Safe guard contains all vehicles, dispatch contains partial vehicles

Safe guard and dispatch service unify charge standard

Location of vehicle, speed etc. road info

location of vehicle, drive track and running data of price evaluator

Police 110 system

Dispatch center1

Dispatch center2

Dispatch center3

Taxi company monitor system

Communication provider select

Depend on scale prevalence
Reduce communication cost

Passenger need cars

Center send cars

GPRS、CDMA、…

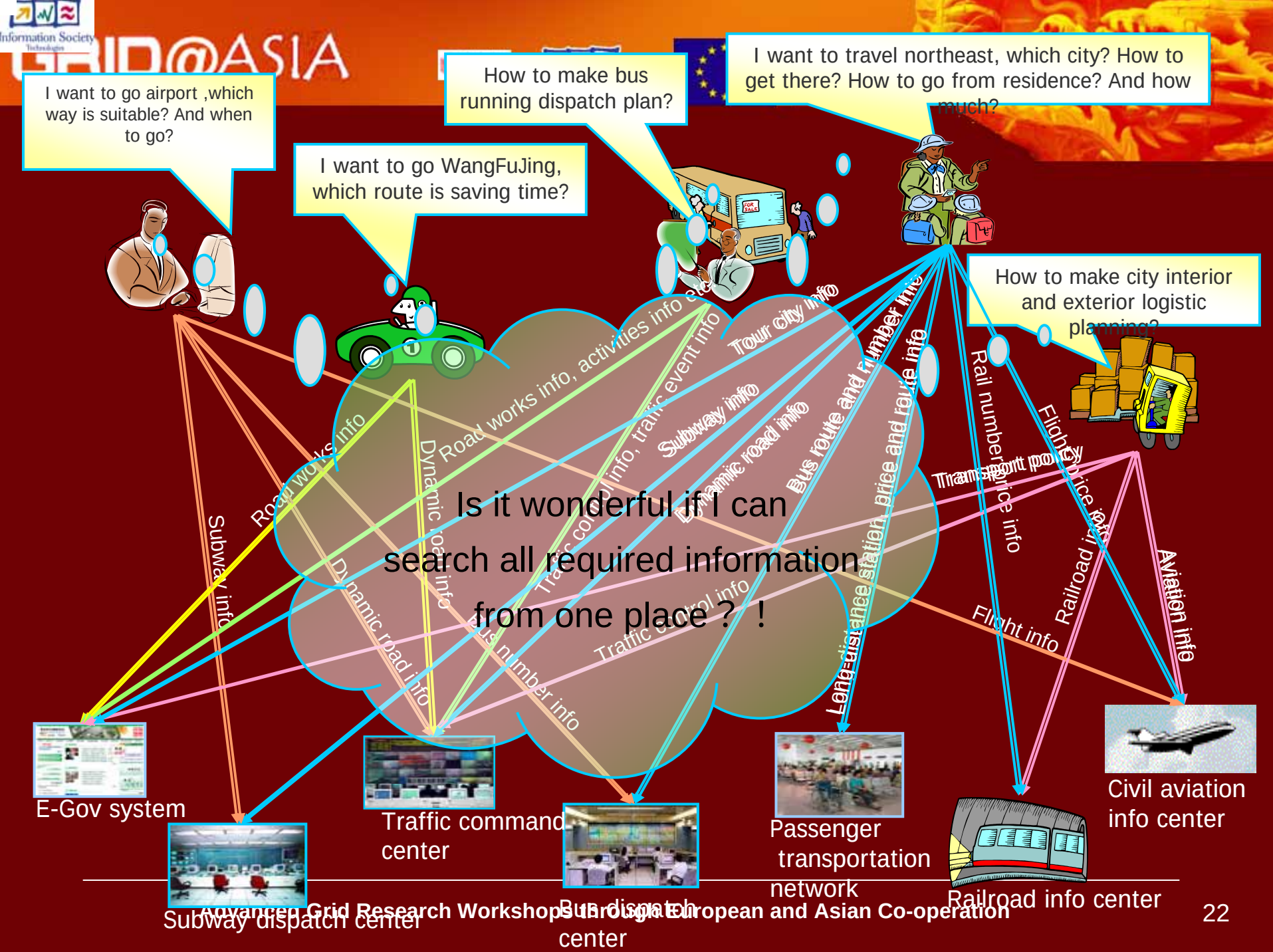
Terminal device

Unified standard
Open competition

Dispatch

Using dispatch, safe guar

Using safe guard only


I want to go airport ,which way is suitable? And when to go?
I want to go WangFuJing, which route is saving time?
How to make bus running dispatch plan?
I want to travel northeast, which city? How to get there? How to go from residence? And how much?
How to make city interior and exterior logistic planning?
Is it wonderful if I can search all required information from one place ? !
Road works info, activities info etc
Tour city info
Subway info
Dynamic road info
Bus route and number info
Long-distance station, price and route info
Rail number info
Flight info
Transport policy info
Railroad info
Aviation info
Traffic control info, traffic event info
Bus number info
E-Gov system
Traffic command center
Passenger transportation network
Civil aviation info center
Subway dispatch center
Bus dispatch center
Railroad info center


Customer before leave


Self-drive customer


traveler


management dept.


Taxi company


Bus company


Logistic company

Citizen travel info service

Government management info service

Enterprise transport organization info service


广播


电视


专用网络

Transport information service system

Real-time, overall, integrated traffic info

Active, diverse, personalized announcement

Beijing integrated information platform of communications

Road works info

Bus exchange info

Dynamic road info

Traffic control info

Public activity info

Park info

Transportation route info

Flight info

Expressway info

Architecture


Traffic info detection


Illegal accident management


TV monitor and affair detection

Communications management information system

Rail traffic

Ground bus

Expressway

Province transport

E-GOV information system

Taxi

Transport information system

Road traffic management Data center (transport committee)

Integrated info system of communications Data center

Transport Data center (communications Dept.)

Citizen travel info service

Government management info service

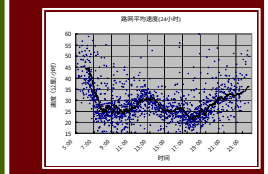
Enterprise transport organization info service

Dynamic navigation

Network of communicaions

Service hot line

.....



Control situation
Support emergency
Service management

Enterprise running plan
Establish reference

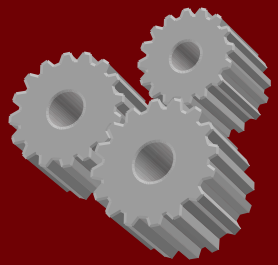
Data collect, access

Data process

Traffic info service

Through ITS, obtain real-time road situation info by digging out vehicle running data collected from Taxi dispatch system

- > 40 km/h
- 20—40 km/h
- < 20 km/h



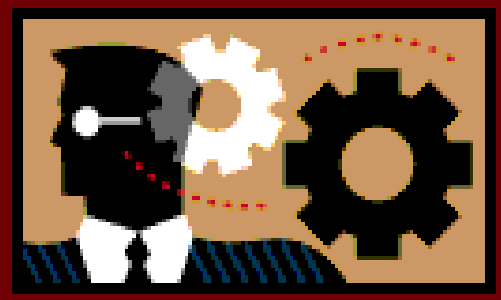
Proposed Research and Corporation Areas

The research and corporation's focus will be on:

1. **Grid Services & Web Services foundations**: architecture, design and development of technologies and systems for the Grid
2. **Web Services and Grid-enabled applications and services for business and society**: promote global adoption of Grid environments and tools.

Road ahead

1. **Further research**
   - Grid enabled
   - High confidence computing
   - …
2. **More kinds of Applications**
   - Grid App.
   - Mission Critical App.
   - …
3. **Standard Organization Affairs**
   - National standard organization
   - International standard organization
   - …
4. **Open source activities**



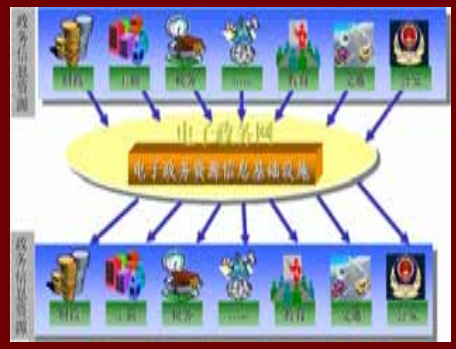
ITS World Congress BEIJING 2007 & Olympic Games 2008

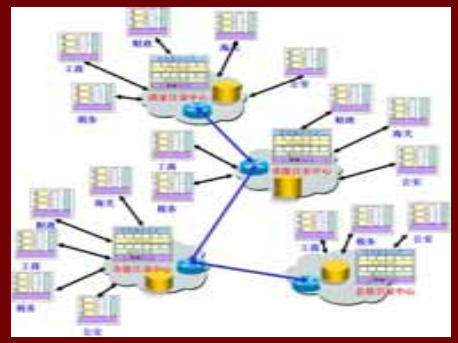
1. 14th World Congress & Exhibition on Intelligent Transport System and Services，2007，Beijing，China
2. Beijing 2008 Olympic Games

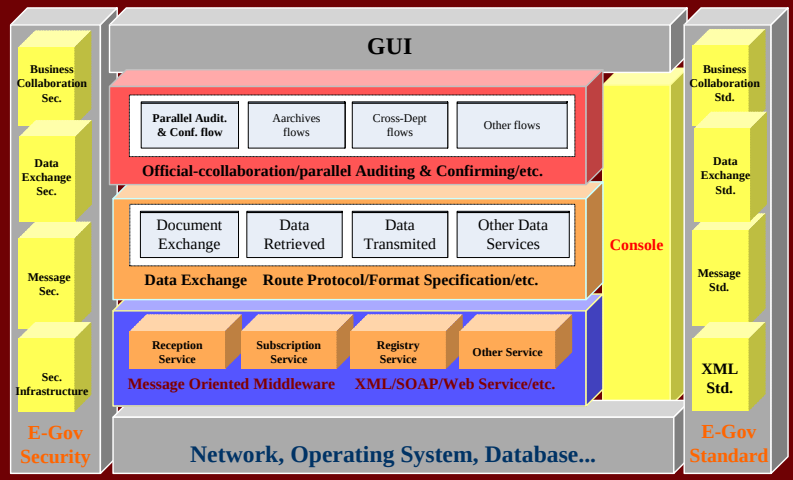
ITS 2007 Beijing

E-Government

1. **Heilongjiang** province E-Government system
2. Demonstration project of the E-government of **Beijing** city
3. The electronic applying system of **State Patent Bureau**
4. China E-government **Standard**

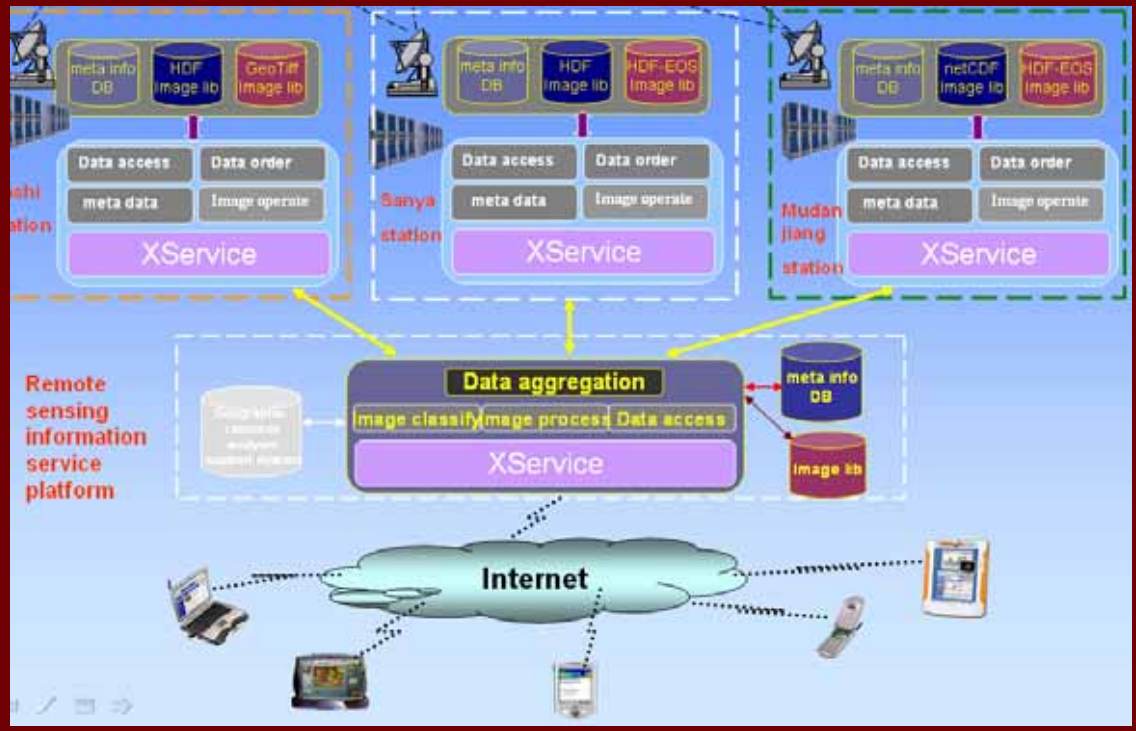






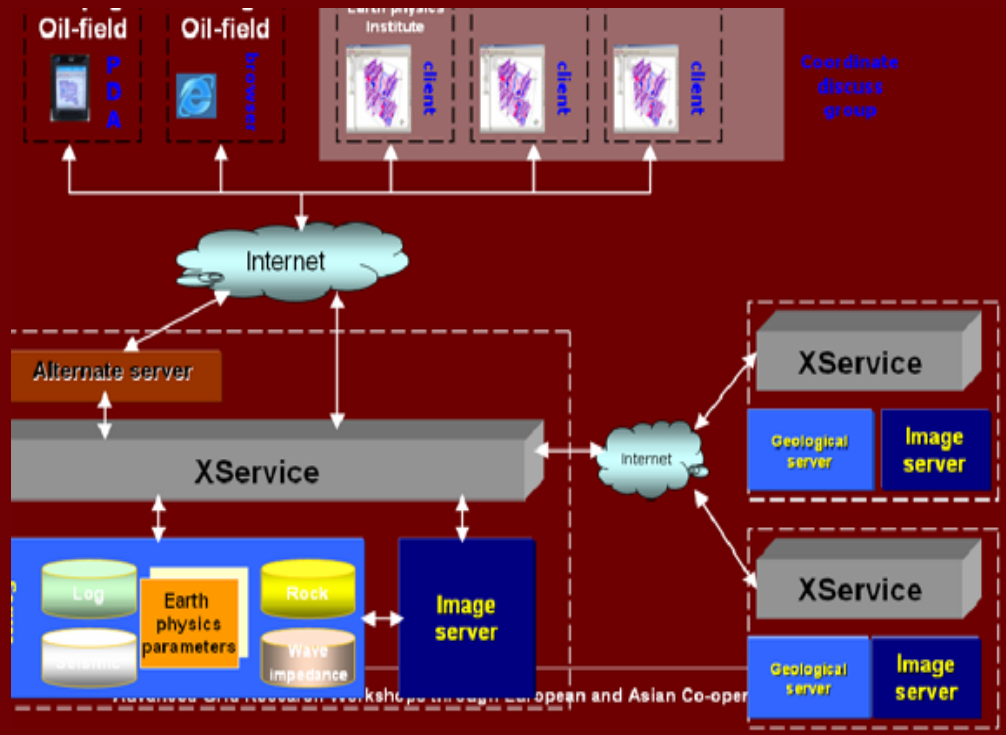
Remote sensing information service platform

1. **Background**
   - one station one satellite
   - information isolated island
2. **Key technology**
   - Share and aggregation of heterogeneous database
   - Reliable transmission of large quantity of information data
   - Service of remote sensing image processing method



Remote geological data visualization system

1. **Background**
   - Experts on different areas cooperate to resolve the multi-solution problem on geological model
   - Analyze models in kinds of terminals through web
2. **Key technology**
   - Realize remote visualization of three-dimensional models
   - Support remote visualization of large quantity data
   - Interoperation of heterogeneous platforms, clients and servers
   - Coordination work between multiple clients



Summary

- Cooperation and research between Europe and Asia have great significance
- Wish cooperation successful !

Beihang University

Beijing University of Aero. & Astro. (BUAA). Since 1952

- Established in 1952, with merging of the Aeronautical Departments of 8 Universities, such as Tsinghua University and Beijing University.
- ***Who is Beihang University***
  - *1952 BIA: Beijing Institute of Aeronautics*
  - *1988 BUAA: Beijing University of Aero.& Astro.*
  - *2002 BUAA: Beihang University listed in the top 12 key Universities.*

Now, it has evolved into a Multi-disciplined Research-oriented University about Science & Engineering

- ***Faculty and Staff Members: over 3300***
  - *14 Academicians of Chinese Academy*
  - *390 Professors, 690 Associate professors*
- ***Education Systems***
  - *Over 26,000 students, including 10,000 Graduate students and post-do.*
  - *14 schools and 5 departs*
  - *6 educational organizations*
  - *45 undergraduate programs*

Frontispiece

Teaching Building

Gymnasium

R&D Bases

Library

Our Campus: A beautiful place for visiting

Spring

Summer

Autumn

Winter

Visitors: some famous scientists in the world

David Abramson

Ian Foster

French Friends

OMII Friends

Microsoft Friends

Welcome to Beihang University

Jinpeng Huai

Thank You

Wei Li

Depei Qian

Dr. **Yan Zhu**

Shanghai, China February the 21th, 2006

Dianfu Ma

北京航空航天大學
BEIHANG UNIVERSITY